

Ageing in the 80s

The Robert Campbell Oration

delivered to the Ulster Medical Society, 10 January 1985.

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It is a great honour to be invited to deliver the Robert Campbell Oration and a humbling experience to inspect the list of previous Campbell orators. Robert Campbell was one of the major figures of Belfast medicine in the early years of this century.¹ He was surgeon to both the Children's Hospital and the Royal Victoria Hospital and pioneered many surgical measures which we now take for granted. He was the first in Ulster to adopt in its entirety the system of aseptic surgery, was an early user of rubber gloves, and the first in Ulster to advocate the use of face masks covering the mouth and nose during operations. His most important contributions were in the operative treatment of hernias in infants and children, and in diagnosing different types of acute appendicitis.

He was also a notable teacher. At an early stage of the preparation of this address I came across some remarks he made on lectures. 'Courses of lectures are relics of the days when printing was in its infancy and treatises of medical subjects were few and far between. Nowadays books are published yearly on every subject in the medical curriculum, most of which contain in readable form the greater part of the material professors and lecturers grind out in mechanical fashion in session after session'. I have to say that at that stage in the preparation of this lecture I found myself in sympathy with his sentiments. He goes on to say that 'lectures . . . should be confined to the discussion of subjects about which some recent information, not yet embodied in the handbooks, could be given and to the elucidation of difficult points which could be more clearly expressed by oral teaching'. He believed that this plan would reduce the number of lectures by four fifths and that the time saved could be spent on clinical instruction in hospital. There is a very modern ring to these sentiments and curriculum planners are still trying to find the correct balance between didactic teaching and clinical instruction.

In the spirit of Robert Campbell's strictures on lectures I shall try to relate some more recent information on the subject of ageing. I plan to discuss some developing knowledge in the field of ageing, to identify some questions which need to be answered and to mention some of the research which has been carried out in the Queen's University Department of Geriatric Medicine.

THE AGEING POPULATION

It is customary to start a discussion on ageing and the elderly by noting the increasing number of old people in our society. The important points are the number of old people in the community at present, the proportion of the population which is occupied by old people, the fact that the very old are

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POPULATION PROJECTIONS (1981 BASED)
ELDERLY POPULATION - NORTHERN IRELAND
(1981 = 100)

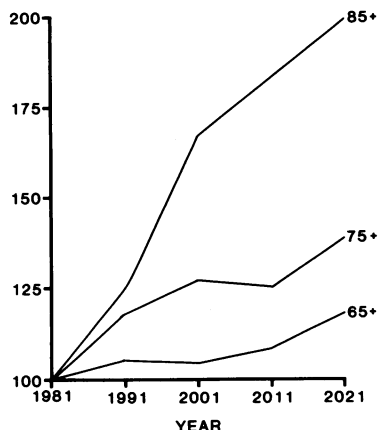


Fig 1. Population projections for the elderly population in Northern Ireland (Based on 1981 population which is taken as 100).

length of time for which a human can survive has not altered appreciably, and hence the survival curve is tending towards a rectangular shape. An implication of the 'rectangularisation' of the survival curve is that there is a ceiling to life expectancy and that biological constraints on the human lifespan will limit further increases in life expectancy.^{5, 6, 7}

It is often suggested that medical discoveries and social advances have increased the survival into old age of younger people but have had virtually no impact on health or survival in old age. Close inspection of recent population statistics shows that this is not so. In recent years the survival of the very old has increased and mortality rates even in centenarians have decreased.^{8,9} As a result the number of old people aged 100 and over has steadily increased in the last 30 years both in Great Britain and in Northern Ireland (Fig 3).

These changes could be interpreted in two ways. One is that more people are surviving to the end of the human lifespan which is somewhere around 110.

The other is that life expectancy is continuing to be pushed outwards, albeit more slowly in the older age groups than in younger people. It seems that the previous idea of a human lifespan fixed at 110 years may have to be modified. Whichever

increasing in number even more rapidly than those in the early years after retirement and that this trend is going to continue for at least the next four decades (Fig 1). Why is there so much interest in this information? It is its implications which are of particular concern. It is sometimes suggested that our society is about to be overwhelmed by a tidal wave of frail elderly people who will ruin our economy by their need for pensions and other financial support and who will virtually take over all our health and social services resources. Phrases like 'the rising tide',² 'the quiet epidemic'³ and 'the impending crisis'⁴ are common in the geriatric literature. Should we be worried about the ageing population? Or will other developments occur to change the picture?

Patterns of human survival have changed greatly over the centuries. There has been a very marked fall in mortality in infancy and childhood with a much greater survival into old age (Fig 2). However, the maximum

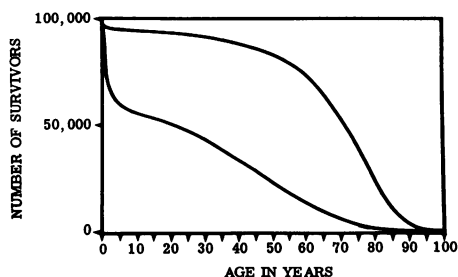


Fig 2. Survival curves. The lower curve represents the pattern of survival in developed countries in previous centuries. There is a high mortality in early life with very few surviving into old age. The upper curve represents survival in developed countries today. There is now a much lower mortality in early life with the majority of people surviving into old age. Nevertheless the age of maximum survival has not changed.

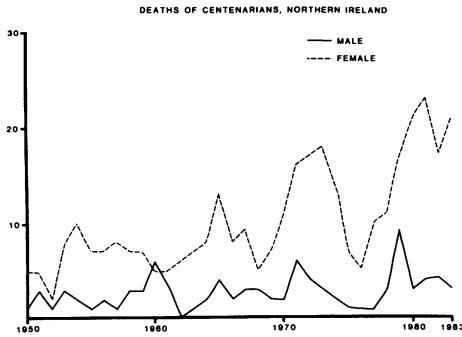


Fig 3. Deaths of centenarians in Northern Ireland 1950 – 1983 (Drawn from data kindly supplied by the Registrar General, Northern Ireland).

interpretation is correct, a reduction in mortality of very old people will have a major impact on the age structure of the country and on the demand for services for the elderly.

AGEING MEN AND WOMEN

One of the striking features of the older population is the progressively increasing proportion of women. This is present in all developed countries, but has only been evident this century. Life expectancy in women is about six years longer than that in men. There are two possible explanations for the greater survival in women: women may be biologically fitter than men, or

men may behave in ways which are more damaging to their health. If the latter is true, then it may be possible to decrease the difference in life expectancy.

What evidence is there for these explanations? Until recently one of the most striking differences in behaviour between men and women was in smoking habits. Evidence that smoking may shorten life expectancy in men has come from studies of groups of people who for cultural or religious reasons do not smoke. In these communities the difference in life expectancy between men and women is very much less than in the population as a whole, although the difference is not totally eliminated^{10, 11, 12} (Table I). It is estimated that about half the difference in life expectancy between men and women can be accounted for by differences in smoking habits.

TABLE I

Life expectancy in the general population of the USA and in three groups of non-smokers¹⁰

	Life expectancy		
	Males	Females	Difference
USA — 1970	71.5	78.0	6.5
California Adventists	78.0	81.2	3.2
California Mormons 1968-75	76.5	79.9	3.4
USA — Non-smokers 1966-68	74.6	78.8	4.2

Surprisingly there have been very few studies directed to biological differences between men and women in old age. In most studies of ageing, men and women have been grouped together for analysis. However, studies carried out in Belfast have identified some differences in elderly men and women. Dr Girvan McConnell, when investigating the mechanism of glucose intolerance in the elderly, studied groups of elderly men and elderly women as well as young men and young women and measured the blood levels of a number of different hormones related to carbohydrate metabolism.¹³ He found significant differences between men and women in some of these hormones, for example, gastric inhibitory polypeptide (GIP) (Fig 4), a hormone related to insulin secretion.

Dr Maeve Rea has been studying neutrophil function which may be related to the resistance of the individual to disease¹⁴ and has identified differences between older males and females in phagocytosis, differences which might be advantageous to females (Fig 5). The biological significance of these findings is not clear at present but they indicate a need for further research into physiological and pathological differences in older men and women. The difference in survival between men and women is probably due to a combination of behavioural and biological differences. Thus the male may be biologically predisposed to more serious effects from behavioural changes than the female.

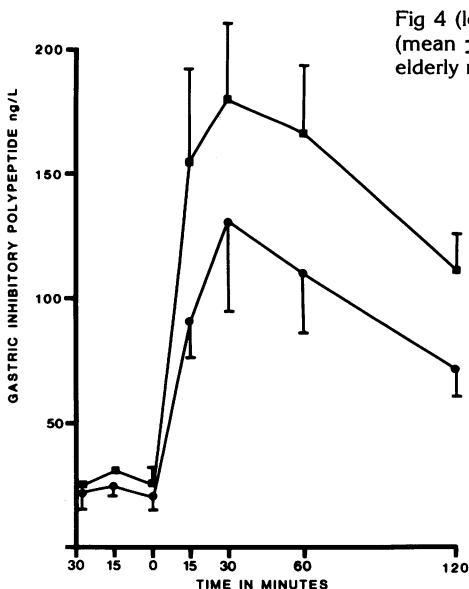


Fig 4 (left). Gastric inhibitory polypeptide (GIP) responses (mean \pm SEM) during 50 g oral glucose tolerance tests in elderly males (circles) and females (squares).¹³

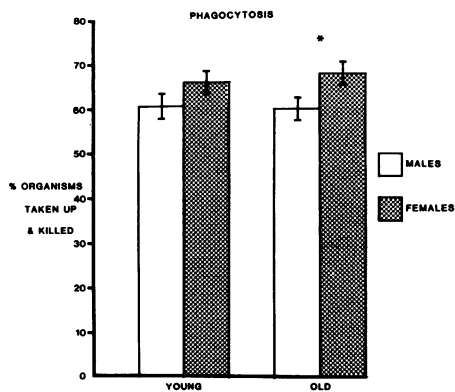


Fig 5 (above). Phagocytosis by neutrophils from healthy young males and females and elderly males and females (mean \pm SEM *indicates statistically significant difference).¹⁴

In this respect it is interesting to look again at the mortality of centenarians. If mortality is recalculated in relation to the number of people alive at age 100, mortality rates are the same in men and women (Fig 6). Thus, it appears that men have a dangerous period of life in their 70s and 80s but, if they survive this, their mortality rates are the same as those of women.

The difference in life expectancy in men and women is not merely a theoretical consideration but is of considerable practical importance. One result of the differential mortality is an imbalance in the numbers of widows and widowers. Apart from the personal problems this causes it has an impact on hospital stay as not only are more unmarried people admitted to hospital, their length of stay is about twice that of married people of the same age.¹⁵ Thus, in an effort to tackle ageing in relation to survival, ageing men appear to be a prime target.

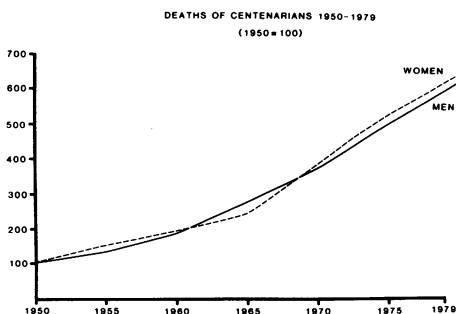


Fig 6. Relative mortality of centenarians 1950-1979. Mortality in males and females in 1950 is taken as 100. (Calculated from data in reference 8).

PHYSICAL AGEING

The obvious physical changes of ageing are well known. Less obvious is the decline in function of multiple organs which may be considered in the context of preservation of the response to stress and the maintenance of homeostasis. Performance is optimal in the twenties and early thirties and then shows a linear decline with much individual variation. The individual not performing at a personal maximum level may improve performance by training, while performance will be decreased temporarily by acute illness or permanently by chronic disease. Reserve function is required when the organism is stressed in order to restore the normal homeostatic equilibrium. As the reserve of individual organs declines, the ability to maintain homeostasis in the face of a threat is reduced.

Acute illnesses occur in the elderly but they are not difficult to manage. However, if they occur in an individual with seriously impaired reserves the outcome may be fatal, or if survival occurs it may be at a higher level of dependency. Death results from an imbalance between the host's resistance and the insult to the equilibrium. The lower the reserve capacity, the less the stress required to cause death, and the lower the resistance, the less the importance of the specific nature of the insult. Clinical and pathological observations suggest that a significant number of deaths, perhaps one in four, occur in individuals with minimal organ reserve¹⁶ and hence are essentially natural deaths occurring within a short time of ultimate physiological limits.

AGE AND CHRONIC DISEASE

The special feature of medicine in older people is the preponderance of chronic disabilities. Chronic disease has different features from acute disease and the approach to it and its management must vary accordingly. The challenge is to deal with disease that cannot be cured, the natural course of which is gradual worsening. The medical aim has to be to slow the rate of progression and to provide forms of assistance to retain a reasonably good quality of life for as long as possible.¹⁷

At the beginning of this century the major medical problem was infectious disease, with tuberculosis the number one killer. It is the reduction in mortality from infectious and other acute diseases which has led to the present era where the major burdens of illness are chronic diseases. Thus, our successes in combating acute disease have resulted in an increased amount of chronic disease. Because the prevalence of chronic diseases and disabilities depends on both the frequency with which they occur and their average duration, the net effects of successful technical innovation used in disease control has been to raise the prevalence of certain diseases and disabilities.

It is not yet clear whether this era of chronic disease will in its turn slowly decline in significance leaving a third era in which the major health problems will be directly related to the process of ageing. Or whether the survival of many more people into old age will increase the prevalence of chronic disease and the burdens that this will have on people, on society, and on the health and social services.

The chronic diseases do not easily fit into the medical model of diseases with single causes and specific cures. The most common and most serious chronic disease is atherosclerosis which is universal and almost life-long in its course.¹⁸ Atherosclerosis probably develops in the later teens and early twenties and

gradually increases in severity throughout the early and middle adult years although remaining asymptomatic in most people. At some stage the affected artery becomes narrowed sufficiently for symptoms to occur, and the patient goes through what may be described as the clinical horizon, with effects on the heart, brain or lower limbs depending on the artery most affected. It seems unlikely that it will be possible to eliminate the atherosclerotic process itself. The aim must be to delay its progression with postponement of the clinical horizon and its disabling complications. Thus differences between individuals are manifested not by the presence or absence of atherosclerosis but by the rate at which it progresses.

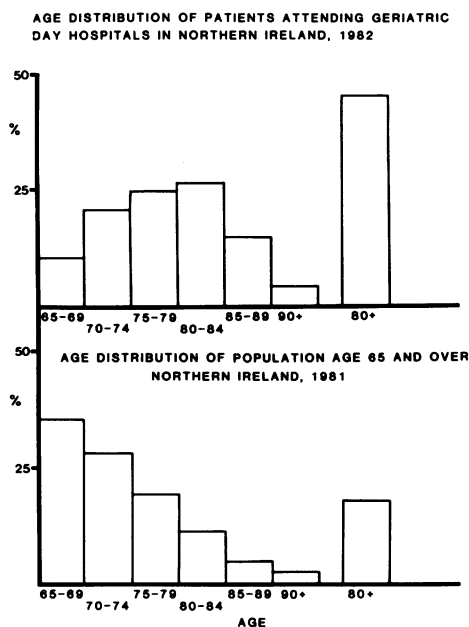
Because atherosclerosis is universal and virtually life-long, life cannot be divided into a pre-atherosclerotic and a post-atherosclerotic phase. However, because there is a symptom threshold, life can be divided into a portion before the threshold is passed and a portion following that threshold. Thus it is reasonable to consider a pre-myocardial infarction or post-infarct phase, or a pre-stroke and a post-stroke phase. The determining factor is the extent and speed of progression of the disease. The question is whether an increase in life expectancy will result in a longer post-stroke or post-infarct phase with its corresponding disability or whether it will be possible to postpone the onset of the clinical horizon. If the clinical horizon can be postponed more rapidly than the increase in life expectancy then the period of terminal infirmity will be shortened.

The goal of medical research is to diminish disease and to enrich life, but in fact we have produced tools which prolong disease and diminish lives and so increase the proportion of people who have disabling or chronic disease. That is a major but unintended effect of many technical improvements stemming from health research.

PRESENTING FEATURES OF CHRONIC DISEASE IN OLD AGE

The impact of age on the need for services for the elderly is clearly shown in Dr Pamela Gawley's study of geriatric day hospitals in Northern Ireland.¹⁹ The age of the patients attending reaches a peak in the 80s and nearly half the patients are aged 80 and over, a very small proportion of the total elderly population being in this age group (Fig 7). How may chronic disease in old age be approached? First, those conditions which cause most problems must be identified. One problem is delay in discharge from hospital. Dr Pamela Maguire has carried out a survey of nearly 400 patients over 70 years of age admitted

Fig 7. Age distribution of patients attending geriatric day hospitals in Northern Ireland compared with age distribution of total population of Northern Ireland aged 65 and over.¹⁹



PATIENTS AGED 70 YEARS AND OVER ADMITTED TO GENERAL MEDICAL WARDS

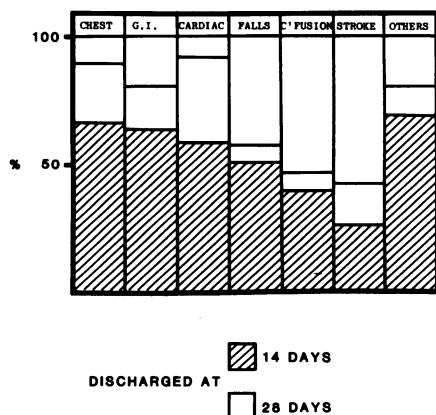


Fig 8. Discharge of patients aged 70 years and over admitted to general wards of the Royal Victoria Hospital in relation to main diagnosis on admission. Columns represent per cent discharged 14 and 28 days after admission.²⁰

Prognosis from stroke is poor. Six months after the stroke 45% of patients have died and only 18% have recovered completely (Fig 10). The patients who survive but do not recover total independence are particularly important because of the burden of disability this causes. Dr Fullerton has identified six factors which appear to be related to outcome from stroke (Table II) and has devised a prognostic index which allows patients, at the time of onset of stroke, to be placed in a prognostic category. In this way patients who require particular attention can be identified. The prognostic index should also be of value in further trials of management of stroke.

to acute medical wards in the Royal Victoria Hospital²⁰ and has identified the conditions which are associated with delayed discharge (Fig 8). Of the admission diagnoses, three resulted in a considerable delay in discharge with fewer than half of those admitted being discharged within 28 days. These were falls, confusion and stroke — clearly areas in which major problems occur in elderly people and where further knowledge would be of great importance.

STROKE

Stroke has traditionally been an area of interest to geriatric units and nowhere more so than in Belfast. Dr Ken Fullerton has carried out a prospective study of over 200 patients with stroke to try to identify those factors which are important in prognosis.²¹ Stroke is commonest in old people (Fig 9).

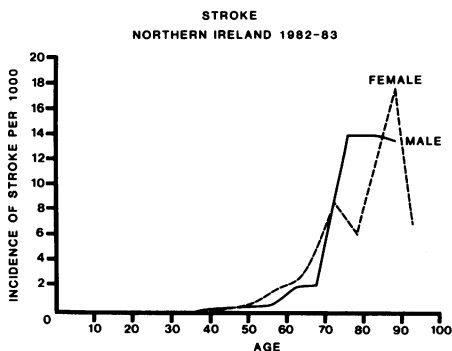


Fig 9. Annual incidence (per 1,000 population) of stroke in the Southern Area of Northern Ireland in males and females in relation to age.²¹

OUTCOME GROUPS IN 205 STROKE PATIENTS

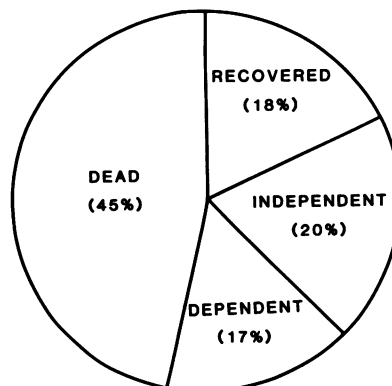


Fig 10. Outcome of 205 stroke patients six months after the onset of the stroke.²¹

TABLE II
Factors related to outcome from stroke²¹

Level of consciousness
Arm power
Leg function
Albert's Test score
Mental score
ECG changes

FALLS

As well as identifying those areas which may be useful to pursue further, it is also valuable, but much less dramatic, to identify measures which, although widely advocated, turn out to be of little value. In the last decade it has been suggested that some neurological symptoms in elderly patients, including falls and mental disturbance, may be related to disorders of cardiac rhythm. Frequent but transient arrhythmias may reduce cardiac output and the blood flow in the cerebral circulation and hence cause damaging effects on brain function. Dr Ian Taylor carried out a study of cardiac arrhythmias in elderly people with a number of conditions, including these 'funny turns' of which so many complain.²² Unlike previous investigators he also studied cardiac rhythm in elderly people without symptoms. Like others he found that cardiac arrhythmias are common in elderly people with 'funny turns' but that they are not more common than in those who did not have these symptoms (Table III). Nor did any of the arrhythmias cause symptoms at the time of the investigation. Thus, while the cause of frequent falls and other 'funny turns' in elderly people has not been identified, at least the idea that disturbance of cardiac rhythm is a major cause does not need to be pursued further.

TABLE III
Disorders of cardiac rhythm in elderly patients with 'funny turns' and asymptomatic controls²²

<i>Type of arrhythmia</i>	<i>Patients with 'funny turns'</i>	<i>Controls</i>
	%	%
1	29	9
2	53	59
3	0	9
4	9	12
5	12	18

FRACTURES

One of the important complications of falls in old people is fracture, particularly fracture of the proximal femur. Dr Hugh Taggart and Dr Tim Beringer have been interested in this problem.²³ There is a close relationship between the incidence of fracture and that of age (Fig 11). Many elderly people who fall and break their legs recover rapidly after appropriate surgical treatment and return to

independence without delay. Some are so disabled before their fall that independence is never regained. But there is a middle group for whom the regaining of independence is very much determined by appropriate treatment and rehabilitation. Since 1981, all the elderly patients admitted to the Belfast City Hospital with femoral neck fractures have had details of their illness entered into a computer programme in the Department of Geriatric Medicine. In general, fractures of the proximal femur affect one of two parts of the bone — the cervical region or the trochanteric region. This audit has revealed that patients with cervical fractures are younger, fitter and recover more rapidly than patients with trochanteric fractures (Table IV). Thus, it is patients with trochanteric fractures who require particular attention.

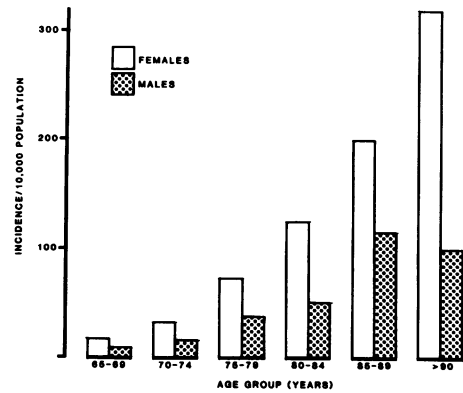


Fig 11. Annual incidence (per 10,000 population) of fracture of the proximal femur in Belfast in males and females in relation to age.²³

TABLE IV

Outcome of elderly people with fractured proximal femur affecting the cervical or trochanteric region of the bone²³

	Outcome		Mean age (years)	Median length of stay (Days)
CERVICAL FRACTURE (n = 87)	Death	17%	83.0	50.0
	Home to residential accommodation*	6%	82.4	148.5
	Continuing hospital care	3%	83.3	167.0
	Return to previous environment	74%	78.0	28.5
	TOTAL	100%	79.3	31.0
TROCHANTERIC FRACTURE (n = 63)	Death	27%	84.8	35.5
	Home to residential accommodation*	3%	81.0	126.0
	Continuing hospital care	6%	88.5	191.5
	Return to previous environment	64%	83.0	51.0
	TOTAL	100%	83.7	49.5

* Patients admitted from home and discharged to residential accommodation.

ENVIRONMENTAL TEMPERATURE

Analysis of fracture incidence in Belfast has shown that fractures are more common in winter months when temperatures are lower (Fig 12). The reason seems obvious — old people slip on icy paths, fall and break their legs. The problem with this explanation is that 85% of the fractures occurred indoors. In Dr Fullerton's study of strokes, the same relationship of stroke incidence to environmental temperature occurred (Fig 13). Thus, it appears that low temperatures have subtle effects on health, not necessarily causing hypothermia but causing other harmful effects. Other studies have shown that low temperature is associated with higher blood pressures²⁴ and with changes in clotting factors.²⁵ Raising the environmental temperature even a few degrees may result in important improvements in the health of old people.

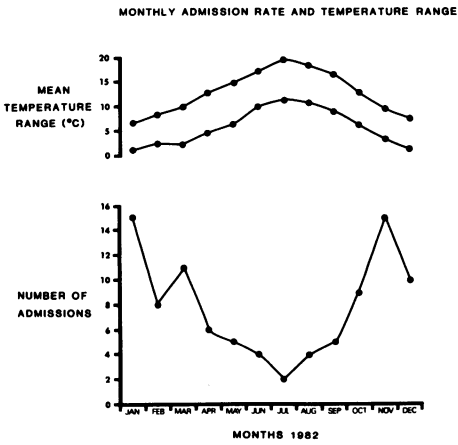


Fig 12 (left). Number of admissions for fractured proximal femur in Belfast and mean monthly maximum and minimum temperatures in 1982. ²³

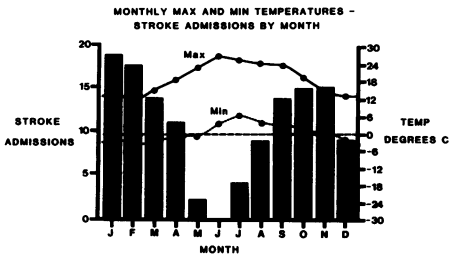


Fig 13 (above). Number of admissions for stroke in the Southern Area, Northern Ireland, and mean monthly maximum and minimum temperatures. ²¹

DEMENTIA

The remaining symptom which was associated with delayed discharge in Dr Maguire's study was confusion. Dementia is closely related to age and is most common in the over 80s. Thus there will be a great increase in the number of people with dementia in the next few decades (Table V). Epidemiological studies in Newcastle-upon-Tyne have shown a change in the pattern of survival of patients with senile dementia between the 1940s and 1970s.²⁶ Mortality has

TABLE V (a)
Age-related prevalence of dementia

Age	Prevalence
65 – 69 years	2.3 %
70 – 74 years	2.9 %
75 – 79 years	5.5 %
80 years and over	22.0 %

TABLE V (b)
Predicted number of people with dementia in Northern Ireland, showing effect of increasing number of very old people

	Population aged 65 +	% change since 1985	People with dementia	% change since 1985
1985	179,000	—	11,758	—
1990	181,000	+ 1.1	12,391	+ 5.4
1995	182,000	+ 1.7	13,289	+ 13.0
2000	178,000	– 0.5	12,861	+ 9.4
2005	177,000	– 1.1	13,017	+ 10.7
2010	183,000	+ 2.2	13,103	+ 11.4
2015	192,000	+ 7.3	13,366	+ 13.7

decreased but the number of those who are inpatients has increased as has the number of those in residential care. Thus, although physical disability in old age may be less prevalent, mental disability in old age is an increasing problem. It seems that, as with the decline in infectious disease which resulted in the appearance of physically disabling conditions, so a decline in physical disability in old age may reveal the major problem of senile dementia. Dementia is not a condition which produces a rapidly fatal outcome, but the burden on families, on social services and on the hospital service caused by dementia is considerable and will increase unless we can gain some further insights into its cause and cure.

POSTPONEMENT OF DISABILITY

Is there any evidence that the burden of disability in old age is declining or being postponed into more advanced age? The recent decline in mortality from coronary disease and stroke may be evidence of this.²⁷ It could be argued that, if mortality is all that is measured, then medicine may in fact be creating survivors who add to the burden of cardiac or neurological disability in old age. It is likely, however, that in these conditions morbidity and mortality are related and that incidence, not just case fatality, is declining.

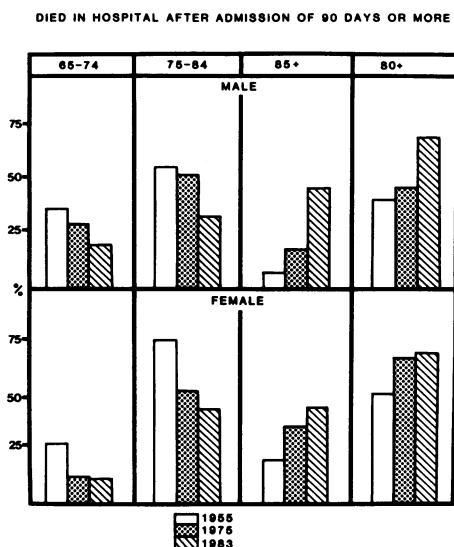


Fig 14. Age at admission of elderly patients to the Geriatric Medical Unit, Belfast City Hospital, for continuing care (defined as those who died in hospital after an admission of 90 days or more) in 1955, 1975 and 1983.

The Geriatric Medical Unit of the Belfast City Hospital has kept detailed records since it first came into operation in 1948. Using these records the age of admission of patients requiring long-term hospital care has been assessed over a period of 28 years. These patients have been defined as those who died in hospital after an admission of at least 90 days. Between 1955 and 1983 there has been a shift in the age of admission of both men and women towards the older age groups (Fig 14). In particular, there has been a steady increase in the age of admission of women and a more recent increase among men. This is evidence that disability in old age is being postponed. Whether the postponement of disability is occurring more rapidly than the increase in life expectancy is not clear. If this is occurring, the time of terminal disability in old age will be shortened. Further analysis is required to answer this question.

CONCLUSIONS

One of the most important features of ageing in the 80s is the great increase in the number of very old people — in their 80s and over. This is due not only to increased survival of younger people into old age, but also to a reduction in the mortality of the very old. In old age decreased mortality does not necessarily imply improvement in the health and quality of life of the survivors. The challenge

is not only to reduce mortality in old age but also to reduce the period of disability and dependency which is the fate of so many old people in the last phase of their lives. Although the age of onset of terminal dependency may have been postponed in the last thirty years, the length of time spent in continuing care has not decreased. Unless the prevalence of disability in old age can be reduced more rapidly than the increase in the number of people entering the later years, the demand for high dependency care will continue to rise.

An approach to reducing disability in the elderly is to identify the most important reasons for prolonged hospital care, and to study these conditions in detail to identify areas where improvements may occur. Such an approach has had some success when applied to the problems of stroke, falls and fractures in old age. Dementia remains one of the major unsolved problems in the elderly and is likely to assume even greater importance as a cause of disability and dependence as the population continues to age. Nevertheless, as individuals, 80-year-olds in the 1980s have better health than ever before, are more likely to respond to treatment if they develop an acute illness and are less likely to develop a chronic disease. The 80s in the 1980s have a good chance of being the 90s in the 1990s and centenarians in the next millenium. We must redouble our efforts to ensure that this will be a welcome development.

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